APPENDIX ${f C}$ ullet NOTATION

Compiled by Alison Deere and Marjolein Ribberink University of British Columbia.

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Roman Symbols, Acronyms & Contractions C881 Greek Symbols C885 Operators C887 Superscripts C887 Subscripts C887 Special Symbols C887

ROMAN SYMBOLS, **ACRONYMS &** CONTRACTIONS



advection of TKE albedo ampere (a unit of electrical current) amplitude area Ball ratio = 0.2 initial analysis north-south amplitude of a wave parameter or constant (varies by context) AAM absolute angular momentum AB Alberta, Canada postal code ABL Atmospheric Boundary Layer ACARS aircraft communication and reporting system albedo of dark-colored daisies A_D albedo of bare ground

 A_G AGL above ground level AIREP aviation report AK Alaska, USA postal code Alabama, USA postal code AL albedo of light-colored daisies AMDAR aircraft meteorological data relay Arctic Oscillation

AR Arkansas, USA postal code argon

ARPEGE Action de Recherche Petite Echelle Grande Echelle (weather-forecast model)

ASDAR aircraft to satellite data relay ASOS automatic surface observing system apparent temperature (heat index)



"Practical Meteorology: An Algebra-based Survey of Atmospheric Science"

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AVCS A _w	arbitrary vertical cross-section global albedo corresponding to an atmo- spheric window	C _B	Bernoulli's constant cell circulation cloud-to-cloud
AWOS AZ	automatic weather observing system Arizona, USA postal code	CCD CCL	charge-coupled devices convective condensation level
1	acceleration	CCN	cloud condensation nuclei
	attenuation coefficient	C_{D}	drag coefficient
	length of semi-major axis of earth's orbit = 149.457 Gm	-Б	fraction of the globe covered by dark dai- sies
	parameter or constant (varies by context)	CF	coriolis force
	spillage distance of front (= external Rossby radius of deforma-	CFL	Courant-Friedrichs-Lewy (condition for numerical stability)
	tion)	CG	cloud-to-ground
	surface albedo	C_G	fractional area covered by bare ground
а	vector acceleration	C_{H}	bulk heat-transfer coefficient
Ή	mixed-layer transport coefficient = 0.0063	CH_4	methane
arccos	inverse of cosine function (cos ⁻¹)	CI	capping inversion
arcsin	inverse of sine function (sin-1)	CIN	convective inhibition
arctan	inverse of tangent function (tan-1)	CL	classic
asin atm	inverse of sine function (sin ⁻¹) atmospheres (a pressure unit)	C_{L}	fraction of the globe covered by light dai- sies
a_{λ}	absorptivity	CMC	Canadian Meteorological Center
		CO	carbon monoxide
			Colorado, USA postal code
В		CO_2	carbon dioxide
		CP	cumulative probability
В	Beaufort wind scale	C _p	specific heat of air at constant pressure
	bias score bowen ratio	C_{pd}	specific heat of dry air at constant pressure = 1004.67 J·kg ⁻² ·K ⁻¹
	breakdown potential for dry air = 3x10 ⁹ V km ⁻¹	C_{pv}	specific heat for water vapor at constant pressure = 1875 J·kg ⁻¹ ·K ⁻¹
	buoyant production or consumption of	$C_{\rm r}$	relative circulation
	TKE	CRT	video screen. Literally: Cathode Ray Tube
BC	boundary conditions	$C_{\rm s}$	seed coverage
	British Columbia, Canada postal code	CSI	critical sucess index
BLG	boundary-layer gradient (wind)	CT	Connecticut, USA postal code
BRN	bulk richardson number	Cu	cumulus cloud
BSS	Brier Skill Score	Curv	curvature
B_{λ}	black-body radiation of a certain wave-	C_{v}	specific heat at constant volume
	length	$C_{vd air}$	specific heat of dry air at constant volume
	parameter or constant (varies by context)	$C_{\rm w}$	vertical drag coefficient
)	absorption cross section	$C_{v}^{"}$	dimensionless cross-wind integrated con-
	damping factor	J	centration
	extinction cross section	°C	degrees Celsius or centigrade, a unit of
	length of semi-minor axis = 149.090 Gm		temperature
	parameter or constant (varies by context)	С	concentration of a pollutant
o_1	parameter or constant (varies by context)		density correction factor
D	dimensionless coefficient		half the distance between two foci of an
o _H	convective transport coefficient		ellipse
-11	to the state of th		maximum concentration
_			parameter or constant (varies by context)
			phase speed or shallow-water wave
			speeds speed of sitation-water wave
	angular rotation in a full circle (360° or 2π		speeds of light through air at sea level pres-
_	radiane)		speed of right through an at sea level pres-

circle circumference (360° or 2π radians)

parameter or constant (varies by context)

Convective Available Potential Energy

constant altitude plan position indicator

circulation

cost

CA

CAN

CAPE

CAPPI

CAT

climatological condition

fractional area covered

specific heat capacity

absolute circulation

clear-air turbulence

air discharge

dimensionless concentration

California, USA postal code

speed of sound

 c_2

 c_3

c₄ cd

cg

cm

cos

cР

covar

speed of light in a vacuum = 299,792,258

parameter or constant (varies by context)

"candela, a unit of luminous intensity"

group speed or group velocity

centimeter, a length unit

continental polar air mass

cosine

speed of light through medium i

crosswind-integrated concentration

intermediate coloublation parameter for alternative replaced propriets and proposed processors of the proposed processors of the processor						
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Delaware, USA postal code Diff	DA	data assimilation		an atmospheric window		
DIAL Differential absorption lidars Differential absorption l	DC	District of Columbia, USA postal code	exp	base of natural logarithms = 2.7182818285		
Diff	DE	Delaware, USA postal code	e_{λ}	emissivity at wavelength λ	G	cyclone graveyard
Discovered to the program Division of the program Division Office of the program Division Of	DIAL	differential absorption lidars				gain
Day by distance warming rate of differential heating at latitude of depth distance between creat and trough of a wave control of summer solution of the first final force of the first final fin	DJF	"December, January, and February"				geostrophic wind speed
DW disbatic warming rate Do of the control allowed the control heating at latitude \$\frac{1}{4}\$ of the control allowed the co	DMSP	defense meterological satellite program				gravitational constant
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d days, a time unit depth diagonal length distance between creat and trough of a wave distance between creat and sum = 149.6 kg. and the control of the cont	D_{ϕ}	net radiative flux, or differential heating,		false-alarm rate	GA	Georgia, USA postal code
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distance between earth and sun = 149.6 Gm Gm Julian day Personal FCP Location of American Scientists Location of American Scientists Location of American Scientists Location of Memirican Scientists		distance between crest and trough of a	FA	free atmosphere		dian numerical model)
Cam F. Coriolis force Cam		wave	FAR	false-alarm ratio	GFS	Global Forecast System
Julian day FC Corlois force centrifugal force FE Centrifugal force Centrif		distance between earth and sun = 149.6	FAS	Federation of American Scientists	GHG	greenhouse gas
plume spread thickness of thickness of thickness of the content of		Gm	F _c	tracer flux	Gm	
plume spread thickness are continued and the component in a compon		Julian day	F_{CF}	Coriolis force	$G_{\rm m}$	gap-geostrophic wind
Capacita		plume spread	F_{CN}	centrifugal force	GMT	Greenwich Mean Time
Julian day of summer solstice = 173		thickness	F_{E}	latent heat flux from earth's surface up		global positioning system (via satellite)
Game Fig. Fig. Forward flamk downdraft GSM Global spectral model GSM GSM Global spectral model GSM	d _{max.rain}	total accumulated depth in a rain gauge		into the air (in kinematic units of	GPU	Graphics Processing Unit
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dd phase shift pha		precipitable water	FFD	Forward flank downdraft		Gilbert's skill score
Page	d_{v}	number of days in a year	FG	flux gradient	GTS	global telecommunication system
Figure 1 beat flux conducted from the ground up to the arth's surface (in kinematic units of km·s²) (negative means downward) Figure 2 collision efficiency	ďBZ	decibels of Z - units of radar reflectivity	F_G	molecular heat conduction	g	
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C884 NOTATION

NP	North Pole	nof	"nounds force per square feet a pressure		reflectivity at one wavelength
		psf	"pounds-force per square foot, a pressure	r_{λ}	reflectivity at one wavelength
NS	Nova Scotia, Canada postal code		unit"	r	ratio of e-folding height to inversion
NSSL	National Severe Storms Laboratory	psi	"pounds-force per square inch, a pressure		strength in the stable boundary layer
NT	Northwest Territories, Canada postal code		unit"		impact parameter
NU	Nunavut, Canada postal code	p'	pressure perturbation (deviation from hy-		radius of curvature
NV	Nevada, USA postal code		drostatic)		distance of gust from downburst center
NVA	negative vorticity advection		,		distance from center of earth
NWP	numerical weather prediction	_			distance from axis of rotation of earth
NWS					
	National Weather Service				distance from center of a hurricane
NY	New York, USA postal code				mesocyclone radius
n	direction pointing toward the center of	Q_1	total amount of pollutant emitted		parameter or constant (varies by context)
	curvature	Q	amount		radius of earth (see R _{earth})
	index of refraction		Q-vector		distance of hurricane eye-wall wind maxi-
	number density		source emission rate of pollutant		mum from the center of the eye
	number of grid points being averaged	Q_{A}	cumulative heating or cooling		average drop radius
	total number	Q_{AK}	cumulative heating or cooling in kinemat-		constant = 0.02
n _i	refractive index	0.0	ic units		earth radius = 6356.766 km
		QC	Quebec, Canada postal code		radius
		$Q_{\rm E}$	latent heat		reflectivity
		Q_H	heat added		radius of downburst
		q	specific humidity		parameter or constant (varies by context)
OFM	operational numerical weather forecast	1	solar forcing ratio		1
01111	model	а	saturation specific humidity		
OH	Ohio, USA postal code	q_s	saturation specific familiarty		
	* *			-	
OK	Oklahoma, USA postal code				
ON	Ontario, Canada postal code	H		S	supersaturation
OR	Oregon, USA postal code				solar radiative forcing
OSSE	Observing System Simulation	R	gas constant in ideal gas law		shear generation of TKE
	Experiment	\Re_d	gas constant for dry air		swirl ratio
0.		r'd	= 0.287053 kPa·K ⁻¹ ·m ³ ·kg ⁻¹		South
O_2	oxygen molecule				
O_3	ozone molecule	~	$= 287.053 \text{ J} \cdot \text{K}^{-1} \cdot \text{kg}^{-1}$		solar constant = 1361 ±7 W⋅m ⁻²
		\Re_{v}	gas constant for pure water vapor		Snell's Law for components
			= 0.4615 kPa·K ⁻¹ ·m ³ ·kg ⁻¹		storm surge height of ocean surface above
			$= 461.5 \text{ J} \cdot \text{K}^{-1} \cdot \text{kg}^{-1}$		normal sea level
		R	radius	S*	critical supersaturation
P	ambient pressure		range	S**	Lagrangian net source/sink of water
1	*				
	perimeter		radius from centre of sphere	S_0	Average total solar irradiance/solar
	period		cyclone radius		constant
	power		distance		internal source of heat per unit mass or
	pressure	R_0	average radius of the earth = 6356.766 km		internal latent heating rate
	probability		smoke-stack top-radius	S_1	parameter or constant (varies by context)
	sidereal orbital period=365.256363 days		net solar input	S_A	available supersaturation
P_0	sea level pressure = 101.325 kPa		critical radius or distance	SBH	sea-breeze head
1 ()		D			
D	reference pressure = 100 kPa	R ₁	parameter or constant (varies by context)	SBL	stable boundary layer
P_1	mean background pressure	RAOB	radiosonde observation	SC	South Carolina, USA postal code
P_a	Pascal, a unit of pressure	RASS	radio acoustic sounding system	SD	South Dakota, USA postal code
PA	Pennsylvania, USA postal code	R_c	radius of curvature	SI	International System of Units (metric
P_B	ambient pressure at bottom of column	Rearth	average earth radius = 6356.766 km, or		units)
Pb	chemical abbreviation for lead	eartii	earth radius at equator = 6378 km	S_{inf}	background supersaturation at a large
_	period oscillation at the Brunt-Väisälä	ref	reference height	olnr	distance from droplet
P_{BV}			flux Richardson number	CIV	
D.C.	frequency	R _f		SK	Saskatchewan, Canada postal code
PC	portion correct	RFD	Rear-flank downdraft	SL	surface layer
P_c	reference pressure at the center of an	RH	relative humidity	SO_2	sulfur dioxide
	anticyclone	RHI	range-height indicator	SOI	Southern Oscillation Index
PCA	Principal Component Analysis	RHS	right hand side	SP	South Pole
P	dynamic pressure	RI	Rhode Island, USA postal code	S_R	equilibrium supersaturation adjacent to
P _{dyn} P _e PE	environmental pressure	Ri	bulk Richardson number	- K	droplet
DE.		KI		CDLI	
1 E	primitive equation	D:	Richardson number	SRH CCM /I	storm relative helicity
D	Prince Edward Island, Canada postal code	Ri _c	critical Richardson number = 0.25	SSM/I	Special Sensor Microwave Imagers
P _{earth} PG	earth orbital period = 365.25463 days	RL	residual layer	SS_{ROC}	ROC skill score
PG	Pasquill-Gifford	RMS	root mean square (error)	SST	stably-stratified turbulence
D.C.		Ro	Rossby number		sea surface temperature
PG_{m}	mesoscale pressure gradient	NO			
PG _m PG _s	mesoscale pressure gradient synoptic-scale pressure gradient	ROC		ST	standard time in the local time zone
PG_s	synoptic-scale pressure gradient	ROC	Relative Operating Characteristic		
PG _s PIBAL	synoptic-scale pressure gradient pilot balloon	ROC Ro _c	Relative Operating Characteristic curvature Rossby number	STP	Standard Temperature and Pressure
PG _s PIBAL PIREPS	synoptic-scale pressure gradient pilot balloon pilot reports (of the weather in flight)	ROC Ro _c RP	Relative Operating Characteristic curvature Rossby number return period	STP S _x	Standard Temperature and Pressure dimensionless spread parameter
PG _s PIBAL PIREPS P _{moon}	synoptic-scale pressure gradient pilot balloon pilot reports (of the weather in flight) lunar orbital period = 27.32 days	ROC Ro _c RP RR	Relative Operating Characteristic curvature Rossby number return period rainfall rate	STP	Standard Temperature and Pressure dimensionless spread parameter distance
PG _s PIBAL PIREPS P _{moon} P _{MSL}	synoptic-scale pressure gradient pilot balloon pilot reports (of the weather in flight) lunar orbital period = 27.32 days mean sea level pressure	ROC Ro _c RP RR RxL	Relative Operating Characteristic curvature Rossby number return period rainfall rate radix layer	STP S _x	Standard Temperature and Pressure dimensionless spread parameter distance horizontal distance
PG _s PIBAL PIREPS P _{moon} P _{MSL} POD	synoptic-scale pressure gradient pilot balloon pilot reports (of the weather in flight) lunar orbital period = 27.32 days mean sea level pressure probabilty of detection	ROC Ro _c RP RR RxL R*	Relative Operating Characteristic curvature Rossby number return period rainfall rate radix layer critical radius	STP S _x	Standard Temperature and Pressure dimensionless spread parameter distance horizontal distance length of side of square
PG _s PIBAL PIREPS P _{moon} P _{MSL} POD PPI	synoptic-scale pressure gradient pilot balloon pilot reports (of the weather in flight) lunar orbital period = 27.32 days mean sea level pressure probabilty of detection plan position indicator	ROC Ro _c RP RR RxL	Relative Operating Characteristic curvature Rossby number return period rainfall rate radix layer critical radius water mixing ratio, a form of humidity	STP S _x	Standard Temperature and Pressure dimensionless spread parameter distance horizontal distance
PG _s PIBAL PIREPS P _{moon} P _{MSL} POD	synoptic-scale pressure gradient pilot balloon pilot reports (of the weather in flight) lunar orbital period = 27.32 days mean sea level pressure probabilty of detection	ROC Ro _c RP RR RxL R*	Relative Operating Characteristic curvature Rossby number return period rainfall rate radix layer critical radius	STP S _x	Standard Temperature and Pressure dimensionless spread parameter distance horizontal distance length of side of square
PG _s PIBAL PIREPS P _{moon} P _{MSL} POD PPI	synoptic-scale pressure gradient pilot balloon pilot reports (of the weather in flight) lunar orbital period = 27.32 days mean sea level pressure probabilty of detection plan position indicator	ROC Ro _c RP RR RxL R*	Relative Operating Characteristic curvature Rossby number return period rainfall rate radix layer critical radius water mixing ratio, a form of humidity	STP S _x	Standard Temperature and Pressure dimensionless spread parameter distance horizontal distance length of side of square path length
PG _s PIBAL PIREPS P _{moon} P _{MSL} POD PPI PPM	synoptic-scale pressure gradient pilot balloon pilot reports (of the weather in flight) lunar orbital period = 27.32 days mean sea level pressure probabilty of detection plan position indicator Perfect Prog Method precipitation rate	ROC Ro _c RP RR RxL R*	Relative Operating Characteristic curvature Rossby number return period rainfall rate radix layer critical radius water mixing ratio, a form of humidity correlation coefficient system response	STP S _x	Standard Temperature and Pressure dimensionless spread parameter distance horizontal distance length of side of square path length seconds, a time unit slope
PG _s PIBAL PIREPS P _{moon} P _{MSL} POD PPI PPM	synoptic-scale pressure gradient pilot balloon pilot reports (of the weather in flight) lunar orbital period = 27.32 days mean sea level pressure probabilty of detection plan position indicator Perfect Prog Method precipitation rate probability	ROC Ro _c RP RR RxL R*	Relative Operating Characteristic curvature Rossby number return period rainfall rate radix layer critical radius water mixing ratio, a form of humidity correlation coefficient system response reflectivity	STP S _x	Standard Temperature and Pressure dimensionless spread parameter distance horizontal distance length of side of square path length seconds, a time unit slope speed of sound
PG _s PIBAL PIREPS P _{moon} PMSL POD PPI PPM Pr	synoptic-scale pressure gradient pilot balloon pilot reports (of the weather in flight) lunar orbital period = 27.32 days mean sea level pressure probabilty of detection plan position indicator Perfect Prog Method precipitation rate probability probability	ROC Ro _c RP RR RxL R* r	Relative Operating Characteristic curvature Rossby number return period rainfall rate radix layer critical radius water mixing ratio, a form of humidity correlation coefficient system response reflectivity tornado radius	STP S _x	Standard Temperature and Pressure dimensionless spread parameter distance horizontal distance length of side of square path length seconds, a time unit slope speed of sound streamline
PG _s PIBAL PIREPS P _{moon} PMSL POD PPI PPM Pr	synoptic-scale pressure gradient pilot balloon pilot reports (of the weather in flight) lunar orbital period = 27.32 days mean sea level pressure probabilty of detection plan position indicator Perfect Prog Method precipitation rate probability probability probability probability of having a given wind speed storm period	ROC Roc RP RR RxL R* r	Relative Operating Characteristic curvature Rossby number return period rainfall rate radix layer critical radius water mixing ratio, a form of humidity correlation coefficient system response reflectivity tornado radius parameter or constant (varies by context)	STP S _x s	Standard Temperature and Pressure dimensionless spread parameter distance horizontal distance length of side of square path length seconds, a time unit slope speed of sound streamline total entropy
PG _s PIBAL PIREPS P _{moon} PMSL POD PPI PPM Pr	synoptic-scale pressure gradient pilot balloon pilot reports (of the weather in flight) lunar orbital period = 27.32 days mean sea level pressure probabilty of detection plan position indicator Perfect Prog Method precipitation rate probability of having a given wind speed storm period pulse repetition frequencies	ROC Roc RP RR RxL R* r	Relative Operating Characteristic curvature Rossby number return period rainfall rate radix layer critical radius water mixing ratio, a form of humidity correlation coefficient system response reflectivity tornado radius parameter or constant (varies by context) radians	STP S _x s	Standard Temperature and Pressure dimensionless spread parameter distance horizontal distance length of side of square path length seconds, a time unit slope speed of sound streamline total entropy parameter or constant (varies by context)
PG _s PIBAL PIREPS P _{moon} PMSL POD PPI PPM Pr	synoptic-scale pressure gradient pilot balloon pilot reports (of the weather in flight) lunar orbital period = 27.32 days mean sea level pressure probabilty of detection plan position indicator Perfect Prog Method precipitation rate probability probability probability of having a given wind speed storm period pulse repetition frequencies pressure at sea level	ROC Roc RP RR RxL R* r	Relative Operating Characteristic curvature Rossby number return period rainfall rate radix layer critical radius water mixing ratio, a form of humidity correlation coefficient system response reflectivity tornado radius parameter or constant (varies by context) radians critical radus (for escape)	STP S _x s	Standard Temperature and Pressure dimensionless spread parameter distance horizontal distance length of side of square path length seconds, a time unit slope speed of sound streamline total entropy parameter or constant (varies by context) sine
PG _s PIBAL PIREPS P _{moon} PMSL POD PPI PPM Pr P _{rain} PRF P _s	synoptic-scale pressure gradient pilot balloon pilot reports (of the weather in flight) lunar orbital period = 27.32 days mean sea level pressure probabilty of detection plan position indicator Perfect Prog Method precipitation rate probability probability probability probability probability pressure at sea level static pressure	ROC Roc RP RR RxL R* r	Relative Operating Characteristic curvature Rossby number return period rainfall rate radix layer critical radius water mixing ratio, a form of humidity correlation coefficient system response reflectivity tornado radius parameter or constant (varies by context) radians critical radus (for escape) cost/loss ratio	STP S _x s	Standard Temperature and Pressure dimensionless spread parameter distance horizontal distance length of side of square path length seconds, a time unit slope speed of sound streamline total entropy parameter or constant (varies by context)
PG _s PIBAL PIREPS P _{moon} PMSL POD PPI PPM Pr P _{rain} PRF P _s	synoptic-scale pressure gradient pilot balloon pilot reports (of the weather in flight) lunar orbital period = 27.32 days mean sea level pressure probabilty of detection plan position indicator Perfect Prog Method precipitation rate probability probability probability probability probability pressure at sea level static pressure	ROC Ro _c RP RR RxL R* r	Relative Operating Characteristic curvature Rossby number return period rainfall rate radix layer critical radius water mixing ratio, a form of humidity correlation coefficient system response reflectivity tornado radius parameter or constant (varies by context) radians critical radus (for escape)	STP S _x s	Standard Temperature and Pressure dimensionless spread parameter distance horizontal distance length of side of square path length seconds, a time unit slope speed of sound streamline total entropy parameter or constant (varies by context) sine
PG _s PIBAL PIREPS Pmoon PMSL POD PPI PPM Pr Prain PRF Ps Sidereal	synoptic-scale pressure gradient pilot balloon pilot reports (of the weather in flight) lunar orbital period = 27.32 days mean sea level pressure probabilty of detection plan position indicator Perfect Prog Method precipitation rate probability probability probability of having a given wind speed storm period pulse repetition frequencies pressure at sea level static pressure sidereal day = 23.94 h	ROC RO _c RP RR RxL R* r	Relative Operating Characteristic curvature Rossby number return period rainfall rate radix layer critical radius water mixing ratio, a form of humidity correlation coefficient system response reflectivity tornado radius parameter or constant (varies by context) radians critical radus (for escape) cost/loss ratio excess-water mixing ratio	STP S _x s	Standard Temperature and Pressure dimensionless spread parameter distance horizontal distance length of side of square path length seconds, a time unit slope speed of sound streamline total entropy parameter or constant (varies by context) sine
PG _s PIBAL PIREPS Pmoon PMSL POD PPI PPM Pr Prain PRF P _s Psidereal	synoptic-scale pressure gradient pilot balloon pilot reports (of the weather in flight) lunar orbital period = 27.32 days mean sea level pressure probabilty of detection plan position indicator Perfect Prog Method precipitation rate probability of having a given wind speed storm period pulse repetition frequencies pressure at sea level static pressure sidereal day = 23.94 h standard sea-level pressure = 101.325 kPa	ROC Ro _c RP RR RxL R* r r ₀ r ₁ rad r _c r _{CL} r _E	Relative Operating Characteristic curvature Rossby number return period rainfall rate radix layer critical radius water mixing ratio, a form of humidity correlation coefficient system response reflectivity tornado radius parameter or constant (varies by context) radians critical radus (for escape) cost/loss ratio excess-water mixing ratio average radius of the earth = 6356.766 km	STP S _x s	Standard Temperature and Pressure dimensionless spread parameter distance horizontal distance length of side of square path length seconds, a time unit slope speed of sound streamline total entropy parameter or constant (varies by context) sine
$\begin{array}{c} PG_s \\ PIBAL \\ PIREPS \\ P_{moon} \\ PMSL \\ POD \\ PPI \\ PPM \\ Pr \\ \end{array}$ $\begin{array}{c} PPM \\ Pr \\ P_{rain} \\ PRF \\ P_s \\ \end{array}$ $\begin{array}{c} P_{sidereal} \\ PSTP \\ P_T \end{array}$	synoptic-scale pressure gradient pilot balloon pilot reports (of the weather in flight) lunar orbital period = 27.32 days mean sea level pressure probability of detection plan position indicator Perfect Prog Method precipitation rate probability probability probability of having a given wind speed storm period pulse repetition frequencies pressure at sea level static pressure sidereal day = 23.94 h standard sea-level pressure = 101.325 kPa ambient pressure at top of column	ROC Ro _c RP RR RxL R* r r ₀ r ₁ rad r _c r _{CL} r _E	Relative Operating Characteristic curvature Rossby number return period rainfall rate radix layer critical radius water mixing ratio, a form of humidity correlation coefficient system response reflectivity tornado radius parameter or constant (varies by context) radians critical radus (for escape) cost/loss ratio excess-water mixing ratio average radius of the earth = 6356.766 km ice mixing ratio	STP S _x s	Standard Temperature and Pressure dimensionless spread parameter distance horizontal distance length of side of square path length seconds, a time unit slope speed of sound streamline total entropy parameter or constant (varies by context) sine
PG _s PIBAL PIREPS Pmoon PMSL POD PPI PPM Pr Prain PRF Ps Psidereal PSTP PT PVA	synoptic-scale pressure gradient pilot balloon pilot reports (of the weather in flight) lunar orbital period = 27.32 days mean sea level pressure probabilty of detection plan position indicator Perfect Prog Method precipitation rate probability probability of having a given wind speed storm period pulse repetition frequencies pressure at sea level static pressure sidereal day = 23.94 h standard sea-level pressure = 101.325 kPa ambient pressure at top of column positive vorticity advection	ROC RO _c RP RR RXL R* r r ₀ r ₁ rad r _c r _{CL} r _E	Relative Operating Characteristic curvature Rossby number return period rainfall rate radix layer critical radius water mixing ratio, a form of humidity correlation coefficient system response reflectivity tornado radius parameter or constant (varies by context) radians critical radus (for escape) cost/loss ratio excess-water mixing ratio average radius of the earth = 6356.766 km ice mixing ratio background mixing ratio	STP S _x s	Standard Temperature and Pressure dimensionless spread parameter distance horizontal distance length of side of square path length seconds, a time unit slope speed of sound streamline total entropy parameter or constant (varies by context) sine steradian
$\begin{array}{c} PG_s \\ PIBAL \\ PIREPS \\ P_{moon} \\ PMSL \\ POD \\ PPI \\ PPM \\ Pr \\ \end{array}$ $\begin{array}{c} PPM \\ Pr \\ P_{rain} \\ PRF \\ P_s \\ \end{array}$ $\begin{array}{c} P_{sidereal} \\ PSTP \\ P_T \end{array}$	synoptic-scale pressure gradient pilot balloon pilot reports (of the weather in flight) lunar orbital period = 27.32 days mean sea level pressure probabilty of detection plan position indicator Perfect Prog Method precipitation rate probability of having a given wind speed storm period pulse repetition frequencies pressure at sea level static pressure sidereal day = 23.94 h standard sea-level pressure = 101.325 kPa ambient pressure at top of column positive vorticity advection potential vorticity unit	ROC RO _c RP RR RxL R* r r ₀ r ₁ rad r _c r _{CL} r _E	Relative Operating Characteristic curvature Rossby number return period rainfall rate radix layer critical radius water mixing ratio, a form of humidity correlation coefficient system response reflectivity tornado radius parameter or constant (varies by context) radians critical radus (for escape) cost/loss ratio excess-water mixing ratio average radius of the earth = 6356.766 km ice mixing ratio background mixing ratio liquid-water mixing ratio	STP S _x s	Standard Temperature and Pressure dimensionless spread parameter distance horizontal distance length of side of square path length seconds, a time unit slope speed of sound streamline total entropy parameter or constant (varies by context) sine steradian
PG _s PIBAL PIREPS Pmoon PMSL POD PPI PPM Pr Prain PRF Ps Psidereal PSTP PT PVA PVU	synoptic-scale pressure gradient pilot balloon pilot reports (of the weather in flight) lunar orbital period = 27.32 days mean sea level pressure probabilty of detection plan position indicator Perfect Prog Method precipitation rate probability probability probability probability of having a given wind speed storm period pulse repetition frequencies pressure at sea level static pressure sidereal day = 23.94 h standard sea-level pressure = 101.325 kPa ambient pressure at top of column positive vorticity advection potential vorticity unit = 10 ⁻⁶ K·m ² ·s ⁻¹ ·kg ⁻¹	ROC RO _c RP RR RXL R* r r ₀ r ₁ rad r _c r _{CL} r _E	Relative Operating Characteristic curvature Rossby number return period rainfall rate radix layer critical radius water mixing ratio, a form of humidity correlation coefficient system response reflectivity tornado radius parameter or constant (varies by context) radians critical radus (for escape) cost/loss ratio excess-water mixing ratio average radius of the earth = 6356.766 km ice mixing ratio background mixing ratio liquid-water mixing ratio saturation mixing ratio	STP S _x s	Standard Temperature and Pressure dimensionless spread parameter distance horizontal distance length of side of square path length seconds, a time unit slope speed of sound streamline total entropy parameter or constant (varies by context) sine steradian
PG _s PIBAL PIREPS Pmoon PMSL POD PPI PPM Pr Prain PRF Ps Psidereal PSTP PT PVA	synoptic-scale pressure gradient pilot balloon pilot reports (of the weather in flight) lunar orbital period = 27.32 days mean sea level pressure probabilty of detection plan position indicator Perfect Prog Method precipitation rate probability probability probability of having a given wind speed storm period pulse repetition frequencies pressure at sea level static pressure sidereal day = 23.94 h standard sea-level pressure = 101.325 kPa ambient pressure at top of column positive vorticity advection potential vorticity unit = 10-6 Km²-s-1-kg-1 parts per billion	ROC RO _c RP RR RxL R* r r ₀ r ₁ rad r _c r _{CL} r _E	Relative Operating Characteristic curvature Rossby number return period rainfall rate radix layer critical radius water mixing ratio, a form of humidity correlation coefficient system response reflectivity tornado radius parameter or constant (varies by context) radians critical radus (for escape) cost/loss ratio excess-water mixing ratio average radius of the earth = 6356.766 km ice mixing ratio background mixing ratio liquid-water mixing ratio saturation mixing ratio total water mixing ratio	STP S _x s	Standard Temperature and Pressure dimensionless spread parameter distance horizontal distance length of side of square path length seconds, a time unit slope speed of sound streamline total entropy parameter or constant (varies by context) sine steradian
PG _s PIBAL PIREOS Pmoon PMSL POD PPI PPM Pr Prain PRF Ps Psidereal PSTP PT PVA PVU	synoptic-scale pressure gradient pilot balloon pilot reports (of the weather in flight) lunar orbital period = 27.32 days mean sea level pressure probabilty of detection plan position indicator Perfect Prog Method precipitation rate probability probability probability probability of having a given wind speed storm period pulse repetition frequencies pressure at sea level static pressure sidereal day = 23.94 h standard sea-level pressure = 101.325 kPa ambient pressure at top of column positive vorticity advection potential vorticity unit = 10 ⁻⁶ K·m ² ·s ⁻¹ ·kg ⁻¹	ROC Roc RP RR RXL R* r r ₀ r ₁ rad r _c r _{CL} r _E r _{inff} r _L r _s	Relative Operating Characteristic curvature Rossby number return period rainfall rate radix layer critical radius water mixing ratio, a form of humidity correlation coefficient system response reflectivity tornado radius parameter or constant (varies by context) radians critical radus (for escape) cost/loss ratio excess-water mixing ratio average radius of the earth = 6356.766 km ice mixing ratio background mixing ratio liquid-water mixing ratio saturation mixing ratio	STP S _x s	Standard Temperature and Pressure dimensionless spread parameter distance horizontal distance length of side of square path length seconds, a time unit slope speed of sound streamline total entropy parameter or constant (varies by context) sine steradian

			M. STEEL 11	WICTIC:	TE METEOROLOGI COO
T_s	surface temperature	U.T.	Upper Tropospheric		receptor from source
T_{sfc}	surface temperature	UTC	Coordinated Universal Time		ratio of heat flux into the ground to the net
T_0	parameter or constant (varies by context)	U_{TH}	component of the thermal wind		radiative flux at the earth's surface
Tr.	freezing temperature in Kelvins = 273.15 K	U'	velocity relative to earth	Xe	Xenon
T_1	parameter or constant (varies by context)	u*	friction velocity	X	abscissa value
T_2 T_A	parameter or constant (varies by context)				distance distance downwind
T_{B}	temperature of atmosphere brightness temperature	1/			distance from centreline
T_d	dew-point temperature	V			distance from front
TD	turbulent drag	V	economic value		distance toward east
	tropical depression		vector wind velocity		path length
T _{dyn}	dynamic temperature		velocity in the y-direction		travel distance
Te	ambient-air absolute temperature		verifying analysis	x'	distance east from arbitrary longitude
	temperature of environment		visual range/visibility		
	effective radiation emission temperature		voltage (in volts)		•
TE	= 255 K		volume	Y	
TE TH	Tennessee, USA postal code thickness	VA	wind component to the north	Y	dimensionless crosswind distance of the
TIBL	thermal internal boundary layer	VAD	Virginia, USA postal code Velocity Azimuth Display	1	receptor from plume centerline
TIROS	Television and InfraRed Operational	VAD	ageostrophic wind component toward the		time period of orbit
TINOU	(satellite) System	'ag	north	YT	Yukon Territory, Canada postal code
TKE	turbulence kinetic energy	V_g	meridional geostrophic winds	y	distance toward north
TL	thermal low	6	geostrophic wind component toward	,	ordinate value
$T_{\rm m}$	absolute temperature		the north		year
TNT	trinitrotoluene (a high explosive)	VHF	very high frequency	yr	year
Torr	a measure of pressure =133.32 Pa	V _{in}	inflow velocity	y'	north-south displacement from center lat-
TOVS	TIROS Operational Vertical Sounder	VLF	very low frequency		itude
Tp	temperature of katabatic layer	Vol	volume of water		
Tr	temperature of parcel required heat transport	V_{r}	gradient wind component toward the North	7	
11	transport of TKE by turbulence	VT	Vermont, USA postal code		
	Total atmospheric and oceanic heat trans-	V _{TH}	component of the thermal wind	z	dimensionless receptor height
	port needed to compensate radiation	VV	vertical visibility	_	radar reflectivity factor
	horizontal transport parameter	V	average molecular speed		Zulu Time (= UTC time)
T_r	net sky transmissivity		molecular speed	Z_{CL}	dimensionless plume centreline height
	reference temperature		total velocity along a streamline	Z_{DR}	differential reflectivity
T_{RL}	residual layer temperature	v'	deviation in meridional velocity relative	$Z_{\rm s}$	dimensionless souce (smoke stack) height
	L trough of warm air aloft		to the mean	Z_{T}^{3}	tropospheric depth (=11km)
TS TSI	Tropical Storm	var	variance	Z	depth
T _{skin}	total solar irradiance temperature of the top few molecules of	v _e	escape velocity velocity of current through the return		effective atmospheric thickness height
¹skin	the Earth's Surface	v_L	stroke path in lightning		vertical distance
TSM	total shear magnitude			z_0	aerodynamic roughness length
T_{SR}	sunrise time			z_1	initial amplitude
TSS	true skill score	- W		z _c	reference height at the centre of an
T_{STP}	standard sea-level temperature =15°C	VV			anticyclone
_	= 288 K	W	velocity in the z-direction	z_{CL}	plume centerline height
T _v	virtual temperature		work	z _i	depth of convective mixed layer
TV TVS	television		thermal updrafts		depth of the atmospheric boundary layer
T _w	tornado vortex signature wet-bulb temperature		wave drag width	7. 0.	mixed-layer depth lifting condensation level (km)
TX	Texas, USA postal code		Watt, a power unit	z_{LCL} z_{s}	physical source (smoke stack) height
t	time		West	z _{stn}	station elevations above sea level
	time step	W_0	stack-top exit velocity	z _T	depth of troposphere =11 km
t_0	time of onset	WA	Washington, USA postal code	1	height of topography
tan	tangent	WBF	Wegener-Bergeron-Findeisen (cold -cloud	z_{Trop}	depth of troposphere =11 km
tcu	towering cumulus		precipitation formation process)	•	
t _d	length of day/time of day	WD	Wave drag		
t _L	Langrangian time scale	WER	weak echo region		
t _{orbit}	orbital time period Coordinated Universal Time	WI	Wisconsin, USA postal code vertical velocity across 50 kPa surface	\sim	~ ~ .
t _{utc}	transmissivity at wavelength λ	W _{mid} WMO	World Meteorological Organization	_	
t_{λ}	transmissivity at wavelength n	WRF	Weather Research and Forecasting	GR	EEK SYMBOLS
		W _s	subsidence velocity magnitude	GIT	LLIX OT MIDOLO
		WV	water vapor		
			West Virginia, USA postal code	A	οι Α.11
U	tangential velocity of earth	WX	Weather	Α,	α Alpha
	velocity in the x-direction	WY	Wyoming, USA postal code	,	•
TI	wind component toward the east	W	terminal velocity	α	angle of ray above horizon
U _{ag}	ageostrophic wind component to the east	w0	parameter or constant (varies by context)		angle of tilt of wave crests

buoyancy velocity scale

max updraft or downdraft speed

Deardorff (convective) velocity scale

dimensionless downwind distance of

ative for subsidence)

synoptic-scale mean vertical velocity (neg-

downburst velocity

entrainment velocity

terminal velocity

transport velocity

cloud diameter/depth

 $w_{B} \\$

 $w_{d} \\$

 $w_{\rm e}$

 \boldsymbol{w}_{s}

 w_T

 w_{max}

velocity in the x-direction wind component toward the east U_{ag} ageostrophic wind component to the east U_d destination air velocity zonal wind U_g geostrophic wind component toward the east UHF ultra-high frequency UHI urban heat island U_{jet} jet stream velocity UK United Kingdom UM Unified Model U_r gradient wind component toward the east URL universal resource locator (internet web address) U_s zonal velocity US/USA UT Utah, USA postal code

 $\begin{array}{ll} \alpha & \text{angle of ray above horizon} \\ & \text{angle of tilt of wave crests} \\ & \text{relative to vertical} \\ & \text{component angle} \\ & \text{elevation angle} \\ & \text{local azimuth angle} \\ & \text{parameter or constant (varies by context)} \\ & \text{slope angle} \\ & \text{specific volume} = 1/\rho \\ & \text{spread parameter} \\ & \text{terrain slope} \\ & \text{wind direction relative to north} \\ & \alpha_1 & \text{rotation angle about the column axis of} \\ & \text{an ice crystal} \\ & \alpha_3 & \text{intermediate calculation parameter} \\ & \text{intermediate calculation parameter} \\ \end{array}$

B, β Beta

 $\begin{array}{lll} \Delta\beta & beamwidth \\ \beta & beta parameter (rate of change of Coriolis \\ parameter with latitude) \\ component angle \\ constant or parameter (varies by context) \\ divergence \\ growth rate \\ Kalman gain \\ rotation angle \\ intermediate calculation parameter \\ \beta_3 & intermediate calculation parameter \\ intermediate calculation parameter \\ \psiedge angle \\ constant or parameter (varies by context) \\ \end{array}$

Γ, γ Gamma

 $\begin{array}{ll} \Gamma & lapse \, rate \, (=-\Delta T/\Delta z) \\ \Gamma_d & dry \, adiabatic \, lapse \, rate \\ \Gamma_{ps} & pre-storm \, lapse \, rate \\ \Gamma_s & saturated \, (moist) \, lapse \, rate \\ \end{array} \\ \begin{array}{ll} \Gamma_a & standard \, atmospheric \, lapse \, rate \\ & = 6.5 \, K \, km^{-1} \\ \end{array} \\ \gamma & crystal \, orientation \, with \, respect \, to \, the \, compass \, direction \, of \, the \, incoming \, light \, ray \, depth parameter \, environmental \, lapse \, rate \, potential \, temperature \, gradient \, above \, the \, atmospheric \, boundary \, layer \, psychrometric \, constant \, \\ & = 0.4 \, (g_{water \, vapor}/kg_{air}) \cdot K^{-1} \, volume \, extinction \, coefficient \, \end{array}$

Δ , δ Delta

 $\begin{array}{lll} \Delta & & \text{change of} \\ \Delta^2 & & \text{Laplacian operator} \\ \delta_{ij} & & \text{Kronecker delta} \\ \delta_s & & \text{solar declination angle} \end{array}$

E, ε Epsilon

 $\begin{array}{ll} \epsilon & & \text{dissipation rate of TKE} \\ & \text{effective emissivity} \\ & \text{intermediate calculation parameter} \\ & \text{obliquity (tilt of earth's axis)} = 23.439^{\circ} \\ & \text{ratio of gas constants for dry air and water} \\ & \text{vapor} = 0.633 \left(g_{\text{water vapor}} / g_{\text{air}} \cdot K^{-1} \right. \\ & \text{viscous dissipation rate of TKE} \\ \epsilon_0 & \text{permittivity of free space (see Appen. B)} \\ \end{array}$

Z, ζ Zeta

 $\begin{array}{lll} \zeta & zenith \ angle \\ & vertical \ vorticity \\ \zeta_a & absolute \ vorticity \\ \zeta_b & relative \ geostrophic \ vorticity \\ \zeta_{IPV} & is entropic \ potential \ vorticity \\ \zeta_p & potential \ vorticity \\ \zeta_r & relative \ vorticity \\ \zeta^* & dimensionless \ height \end{array}$

H, n Eta

η' vertical displacement of a wave

Θ , θ , ϑ Theta

angle of light ray

mixed-layer potential temperature potential temperature θ_1 viewing angle incident angle θ_2 viewing angle refracted angle reflected angle θ_3 ambient potential temperature θ_{a} critical angle θ_{c} equivalent potential temperature θ_{e} potential temperature of the environment $\theta_{\rm H}$ ĥorizontal angle horizontal viewing angle liquid-water potential temperature θ_{L} θ_{ML} mixed-layer potential temperature initial gas temperature of effluent from a smoke stack potential temperature of an air parcel θ_{sfc} surface potential temperature vertical angle vertical viewing angle virtual potential temperature wet-bulb potential temperature

I, ı Iota

К, к Карра

Λ, λ Lambda

 $\begin{array}{lll} \Lambda & & \text{parameter or constant (varies by context)} \\ \lambda & & \text{wavelength} \\ & & \text{dimensionless wave parameter} \\ & & \text{true longitude angle} \\ & & \text{climate sensitivity factor} \\ & & \text{horizontal scale} \\ \lambda_{\text{d}} & & \text{internal Rossby radius of deformation} \\ \lambda_{\text{T}} & & \text{longitude} \\ \lambda_{\text{R}} & & \text{external Rossby radius of deformation} \\ \lambda_{\text{max}} & & \text{wavelength of peak emission} \\ \lambda_{2} & & \text{parameter or constant (varies by context)} \end{array}$

M, µ Mu

 $\begin{array}{ll} \mu_{ij} & \text{ratio of refractive indicies } n_i \text{ and } n_j \\ \mu m & \text{micrometer, a unit of length} \end{array}$

N, v Nu

v frequency true anomaly

Ξ, ξ Χί

O, o Omicron

П. π Рі

π math constant = 3.141 592 653 589 793 238 462 643 dimensionless group

P, ρ Rho

density average sea-level density = 1.225 kg·m⁻³ density of air at sea-level $\rho_0 \\$ density of object density of air density of dry air density of fluid $\rho_{\boldsymbol{f}}$ co-polar correlation coefficient ρ_{HV} ice density density of liquid water $\rho_{L} \\$ number density of molecules standard sea-level density = 1.225 kg·m⁻³ $\rho_{m} \\$ ρ_{STP} absolute humidity $\rho_{\rm v}$ = density of water vapor ρ_{ve} excess water vapor density saturation value of absolute humidity $\rho_{\rm vs}$ ρ_{water} density of water

Σ , σ , ς Sigma

backscatter cross-section area parameter of constant (varies by context) standard deviation surface tension wavenumber standard deviation of raw observation σ_{c} standard deviation of drop radii $\sigma_1 \\ \sigma^2$ standard deviation of errors associate σ_f with first guess from previous forecast standard deviation of errors associated $\sigma_{\!g}$ with first guess cloud-cover fraction of high clouds $\sigma_{\!H}$ cloud-cover fraction of low clouds σ_L cloud-cover fraction of middle clouds $\sigma_{\!M}$ Stefan-Boltzmann constant (see App. B) σ_{SB} lateral standard deviation of smoke-plume $\sigma_{\!y}$ spread lateral variance of smoke-plume spread σ_v^2 dimensionless lateral standard deviation σ_{yd} of smoke plume vertical standard deviation of smoke- $\sigma_{\!_Z}$ plume spread $\sigma_{\!z}^{\ 2}$ vertical variance of smoke-plume spread vertical standard deviation of cross- σ_{zc} wind-integrated concentration of pollutant dimensionless vertical standard deviation σ_{zdc} of crosswind-integrated concentra-

T, τ Tau

τ optical thickness stress perihelion date time scale e-folding time transmittance

Y, υ, Υ Upsilon

Φ , ϕ , φ Phi

 $\begin{array}{ll} \Phi & & \text{geopotential} \\ \Phi_r & & \text{tilt of Earth's axis relative to the ecliptic} \\ & = 23.44^\circ \end{array}$

angle between wind direction and sound-propagation direction direction

S

latitude intermediate calculation parameter

Χ, χ Chi

Psi

elevation angle

Ω , ω Omega

Ω ohms, a measure of resistance $\Omega_{\rm d}$ angular velocity angular rotation rate of the earth ω angular frequency Earth's rotation rate = 0.0043633 radians/ $\omega_{\rm F}$

Variant Pi ω

 ω equinox precession = angle of the perihelion from the vernal equinox

OPERATORS

total derivative partial derivative $\Delta()$ difference, or change of (overbar) average or mean of (prime) deviation from the mean matrix at height z absolute value amplitude (of wave) integral of sum of product of $\Pi()$ multiplication

SUPERSCRIPTS

()' (prime) deviation from the mean first guess perturbation turbulent variation

SUBSCRIPTS

at height 1 at height 2 any quantity Α of parcel A analysis ABL, abl atmospheric boundary layer AD advection adv advection ai rays going from air to ice air of air average avg В of parcel B

bottom of troposphere black or dark daisies boundary layer BLG boundary layer gradient (wind) of parcel C °С in degrees Celsius cloud condensation nuclei CCN Coriolis Force CF CN centrifugal force conduction cond d destination flow in the most narrow part of a channel or mountain pass Е latent heat e environment earth earth of the earth effective eff equilibrium final final state ground G bare ground geostrophic first guess Η of heat ia rays going from ice to air destination index init initial

source index K in Kelvin data point index liauid LCL lifting condensation level at the left side of a volume or box left liquid liq maximum max mid mid-level at midpoint of column initial value MLmixed layer mtn of a mountain

mean background value or reference 0 state observation initial condition parcel p PG pressure gradient R reference condition of radiation rad reference condition ref at the right side of a volume or box right RI. residual layer

radix layer surface source index upstream flow SBE of the sea-breeze front sfc surface skin at the top molecules of the earth's sur-

face SL surface layer SL or sl sea level

RxI

SST sea surface temperature STP strandard temperature and pressure

sun top of troposphere at time t TD turbulent drag TH thickness thermal

turb turbulent or turbulence u component of wind u v component of wind V virtual

W white or light daisies vertical component of wind W

of water water of parcel X X variable in the x direction

θ

component toward the east variable in the y direction y component toward the north variable in the z direction component in upward direction

potential temperature

at one wavelength at latitude . °С in degrees celsius at a far or infinite distance away

SPECIAL SYMBOLS

key equation or concept

multiply operator

computer spreadsheet should be used to solve this homework exercise I dynamic flux gas constant in ideal gas law gas constant in ideal gas law for dry air $\Re_{\mathcal{A}}$ $\Re_{\mathbf{v}}$ gas constant in ideal gas law for pure water vapor

C888 NOTATION